Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supporting information

A light-heat synergism in the Sub-bandgap Photocatalytic Response of Pristine TiO_2: A study of *in-situ* Diffusion Reflectance and Vacuum Conductance

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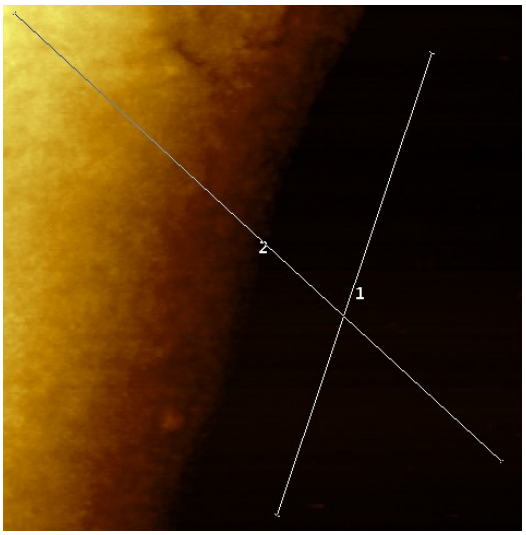

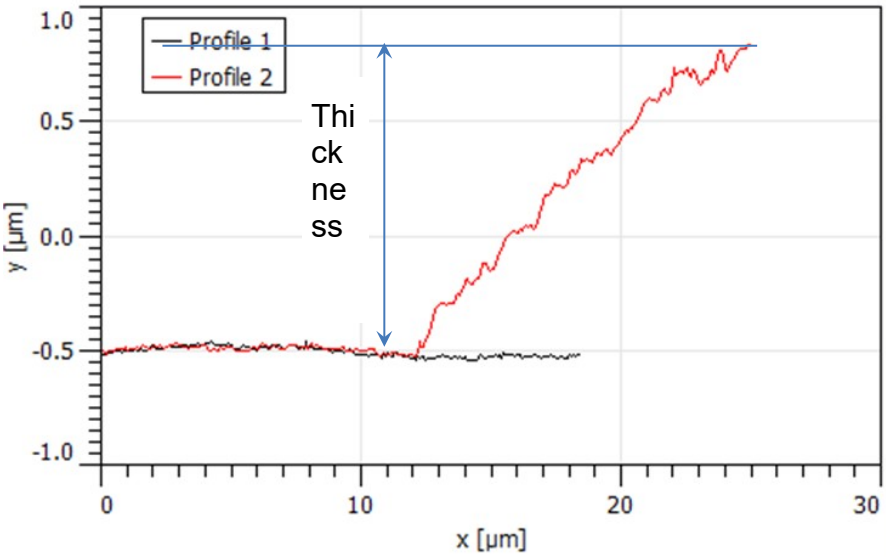

Fig. S1 Atomic force microscopic three image of the TiO_2 coating; the thickness is determined from the step between the glass substrate and the coating, about ~ 1.5 µm

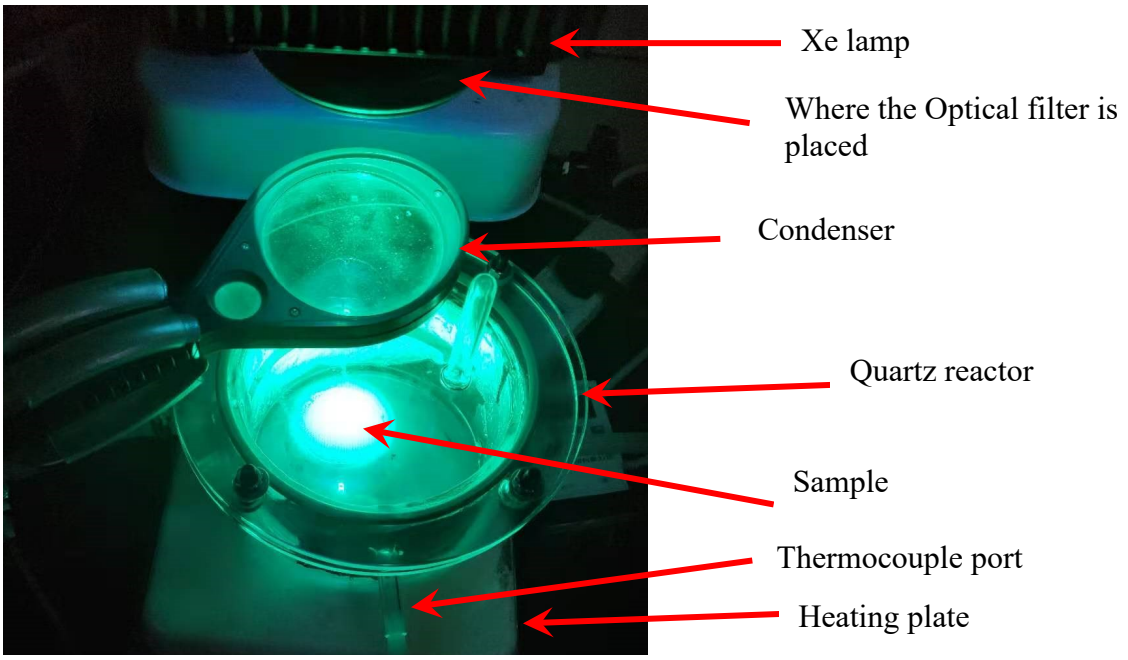

Fig. S2. Digital picture of the reactor setup used for the photocatalytic reactions; Xe lamp was used as the light source for photocatalytic reactions. A 420 nm short-cutting + a band-passing optical filters was equipped to generate a monochromic light. A condenser placed under the Xe lamp to concentrate the light upon the sample in the quartz glass reactor below, which was placed on a heating plate. A thermocouple can be inserted into the quartz glass reactor and the tip can be place over the sample surface to measure the temperature.

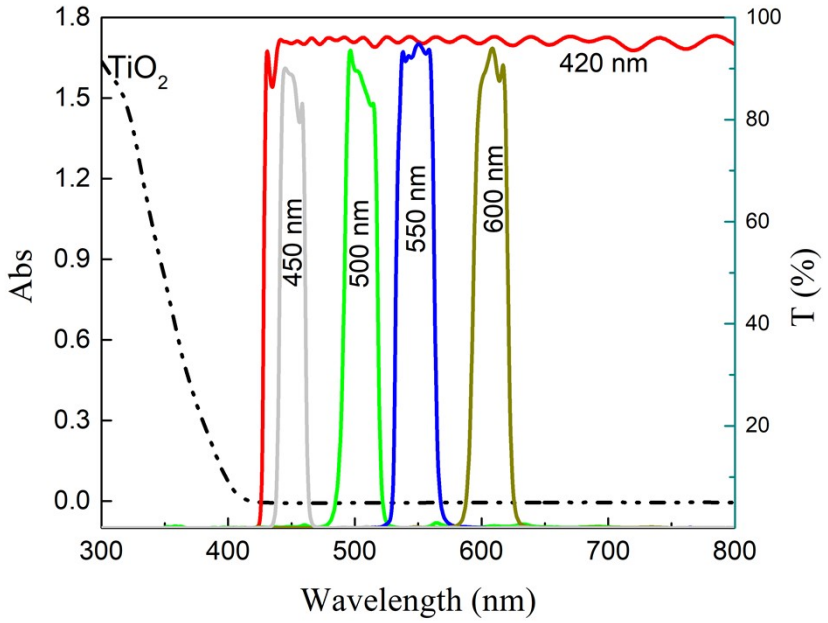

Fig. S3. Diffusion absorption spectrum of the pristine P25 TiO_2 powder and transmittance spectra of the optical filters; the 420 nm short-cutting filters was combined with the band-passing filters to generate the monochromic light of 450 nm, 500 nm, 550 nm, and 600 nm, respectively, which was used to illuminate the TiO2 sample for sub-bandgap photocatalysis

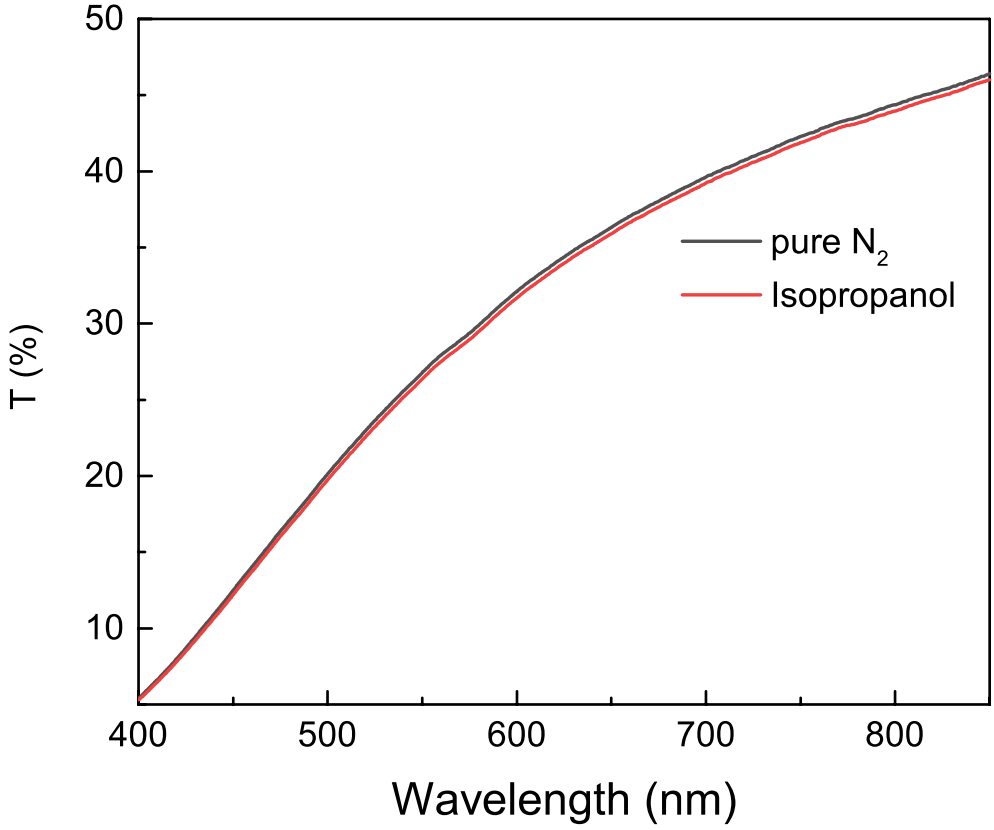

Fig. S4. Transmittance spectra of the p25 coating in the absence and presence of isopropanol standard gas at room temperature

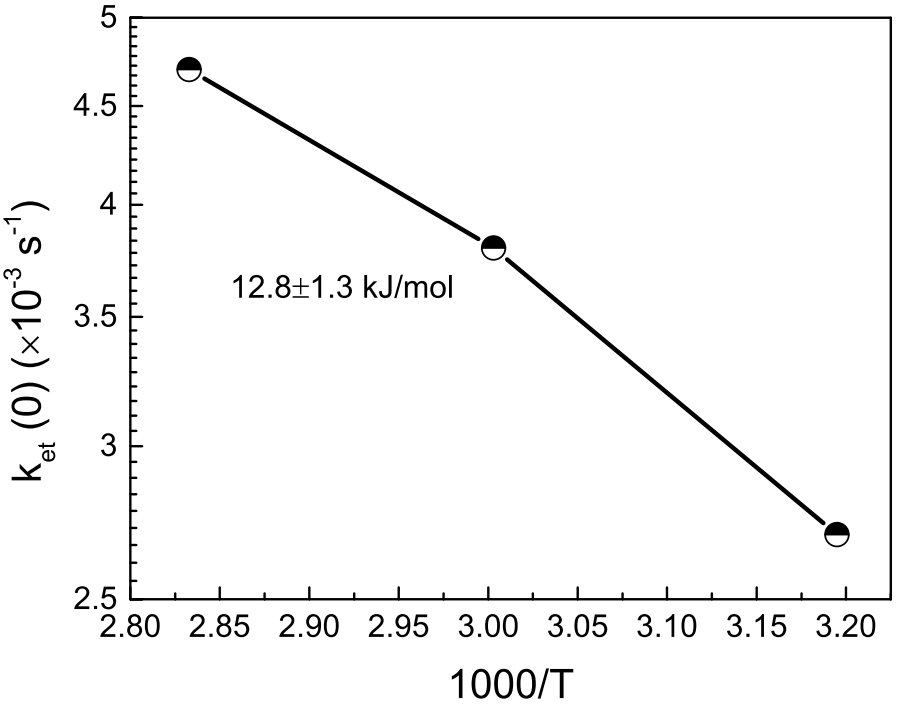

Fig. S5. Arrhenius dependence of the *k*(*0*) obtained from the absorption relaxations after the end of the light illuminations according the eqn. (2).

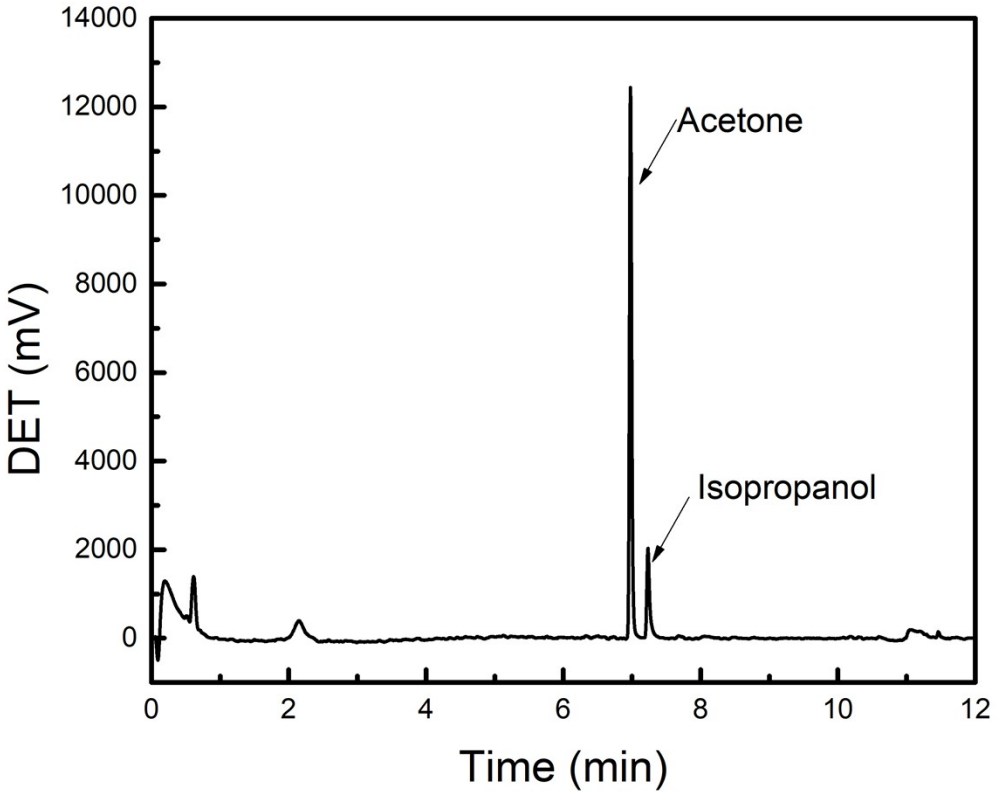

Fig. S6. Time dependence of GC spectrum in the course of IPA dehydrogenation under 500 nm monochromic light illumination at 100 °C

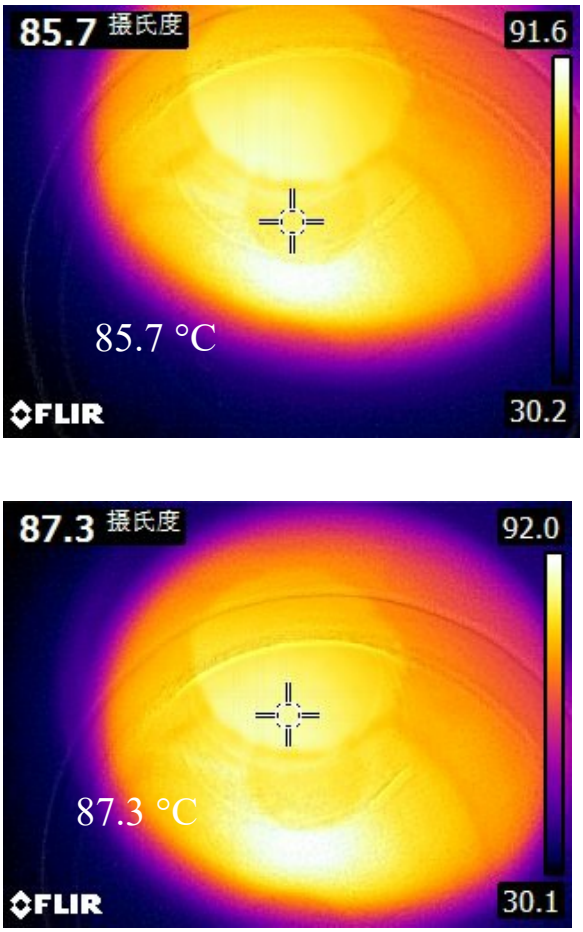

Fig. S7. IR thermographic images of the TiO_2 surface before (a) and after (b) 500 nm light illumination (~ 35 mW/cm^2)

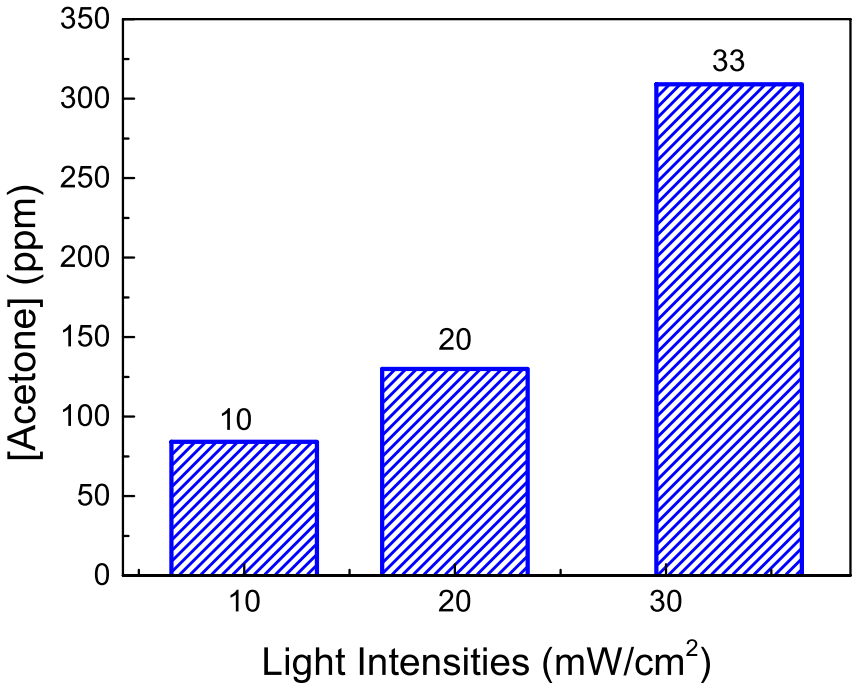

Fig. S8. Dependence of the acetone yields after 84 min IPA dehydrogenation reactions under 500 nm monochromic light illumination at 100 °C

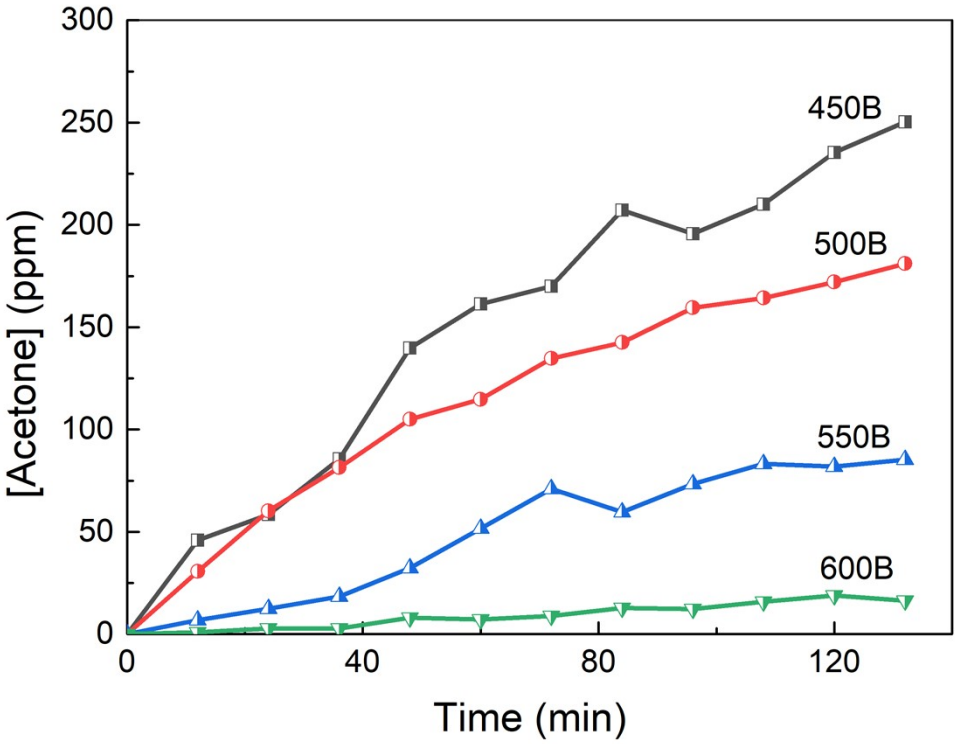

Fig. S9. Time dependence of the acetone evolutions in the course of IPA dehydrogenation under the 450 nm (23 mW/cm^2), 500 nm (35 mW/cm^2), 550 nm (46 mW/cm^2), and 600 nm (38 mW/cm^2) monochromic light illumination at 80 °C

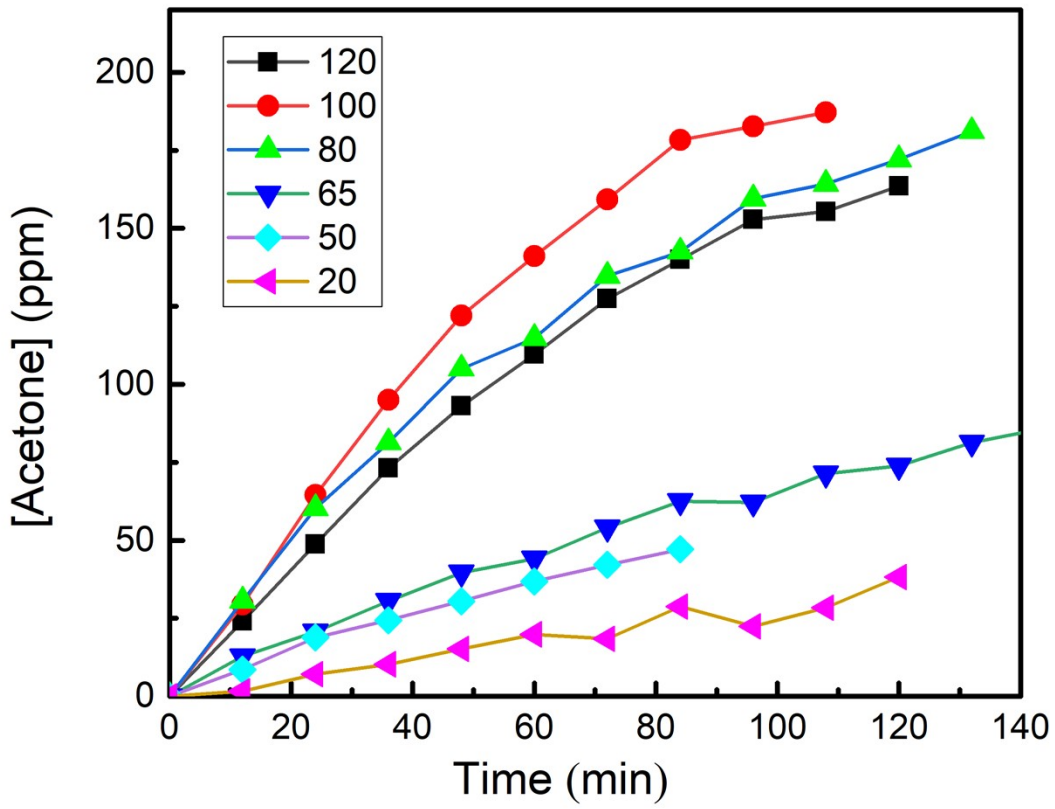

Fig. S10. Time dependences of the acetone yields in the course of the IPA dehydrogenation under 500 nm (33 mW/cm^2) light illuminations at different temperatures

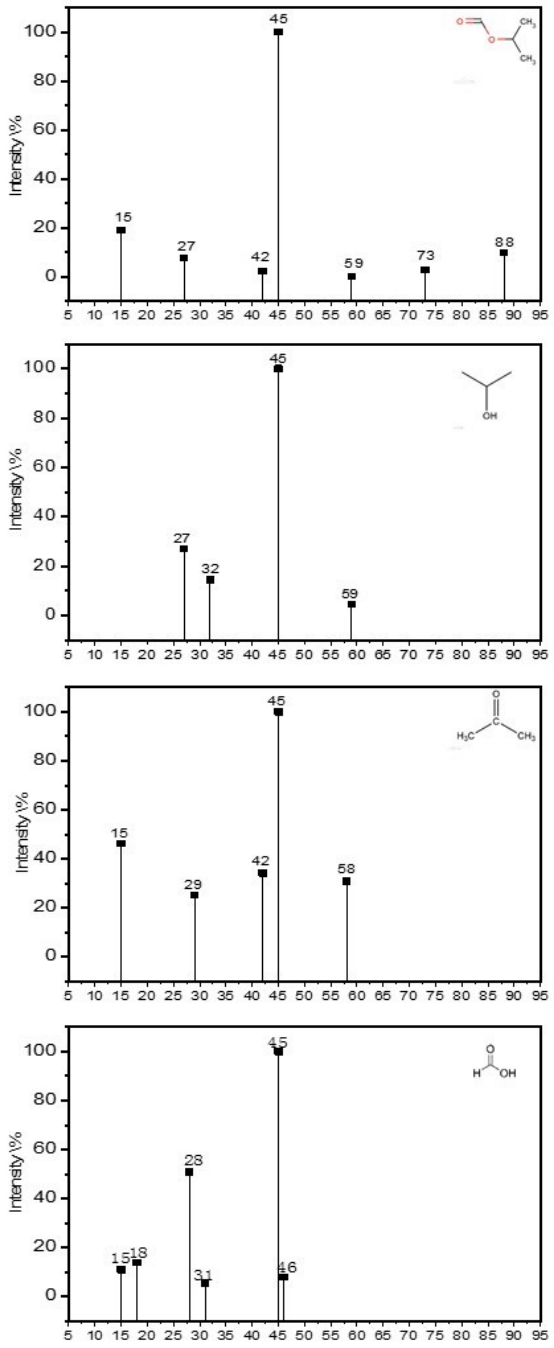

Fig. S11 Mass spectra of the products generated from the isopropanol dehydrogenation at 120 °C under 500 nm monochromic light illumination.

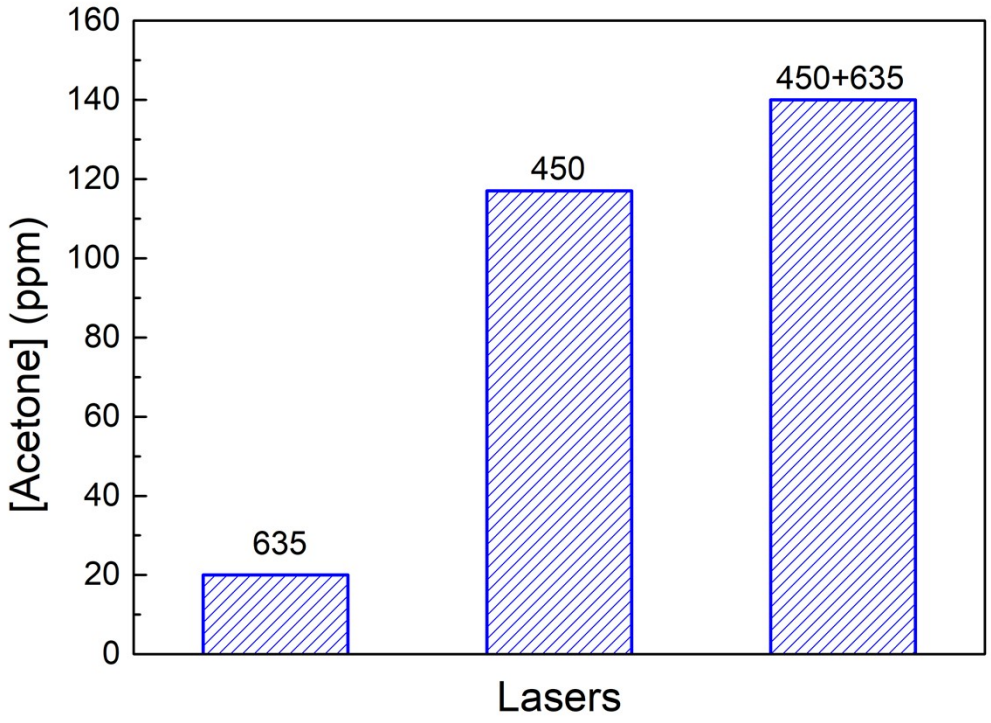

Fig. S12. Photocatalytic acetone yields under 635 nm laser, 450 laser, and 450 nm + 635 nm laser illuminations